NOTE ON THE "LITHOLOGIE DU FOND DES MERS" OF M. DELESSE.

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(*Read before the American Philosophical Society, April 21st,* 1876.)

M. Delesse acknowledges his indebtedness to the treatises in Geology of Elie de Beaumont and Jas. D. Dana, in the first few prefatory pages. The following shows the scope and direction of the work:

I. Preliminaries. Methods pursued in studying the deposits. Orography of France and her submarine shores.

II. Principal agents of marine deposits.

Organic agents.

Inorganic agents { External { Atmosphere. / Fresh and brackish waters. / The Sea. } / Internal { Subterranean waters. / Eruptions. / Dislocations. }

III. Marine deposits of the Coast of France. Shore deposits and submarine deposits. Distribution of Mollusks.

IV. Lithology of the principal seas of the globe. France. The ancient world. The modern world.

V. France at different geological epochs. Deposits of the ancient seas of France. Changes undergone by these deposits.

M. Delesse then describes his methods of investigation.

Fine sand is treated with hydrochloric acid, its loss of CO_2 determined, and this multiplied by 2.27 to obtain the carbonate of lime. This method is accurate enough. Magnetic iron is separated by a magnet. Part of the gangue comes out with the magnet. This augments the magnetic sand on the one hand; on the other much of the magnetic sand is not taken up; so that these two errors are on opposite sides.

Sands and gravels examined contained 0.54 to 2.70 p. c. of soluble material (sea salts and organic matter). Argillaceous sand has a tendency to remove salts from the water containing them.

The classification of the deposit was had without recourse to chemical analysis, by the microscope.

The sieve used had meshes with a diagonal of 1 mm. The universality of the presence of quartz is very striking. Even vegetable mould and that too resting on calcareous rocks show a notable proportion of quartz. Quartz is more abundant the more the waters are agitated.

The sand dunes of the coasts of France are mainly composed of hyaline quartz, whitish gray. They slope gently towards the sea at about 7°; landwards about 29° to 35°, and have been seen to advance in a high wind in spite of a heavy fall of rain 0.6 m in three hours. The absence of mud in dunes is noteworthy but easily explained, since this substance hinders the formation of dunes.

The minimum rainfall in France is in the region bordered by Troyes, Meaux, Compiègne, Epernay (40 centimetres).

On the Ain (one of the affluents of the Upper Rhone) it is over 120 centimetres.

Up the Seine from Paris about 28 p. c. of all the water which falls in whatever form finds its way into that river (within that hydrographic basin); 53 p. c. in the basin of the Saône near Trevoux. For the Garonne above Marmande and for the Auxois which flows over impermeable marls it rises to 65 p. c. The percentage increases in schistose and granitic regions.

It is noticeable that the rivers which flow over calcareous beds do not exhibit a large amount of limestone in their *débris*, as for example the Loire. This is attributed to the softness of calcareous fragments and their inability to resist triturition. [It may be remarked that this explanation will only apply to the deposits at considerable distances from the edge of the calcareous formation, for otherwise the waste would be constantly renewed.]

400 metres from the mouth of the Lez the sandy deposits contain over 60 p. c. of carbonate of lime. At the mouth it consists of 23 p. c. carbonate of lime, with great numbers of flakes of green mica.

The Herault 600 m. from its mouth deposits a reddish gray gravelly sand, consisting of hyaline quartz with orthoclase, feldspars and granitic *débris*, much argillaceous schist, reddish brown mud, gray mica schist, greenish quartz, sand, and some tablets of silvery mica.

Magnetic sand is found here in large quantity and is derived from the igneous rocks over which the river flows.

These few notes will serve to convey an idea of how this part of the subject is treated.

By far the most striking, as the most valuable, part of M. Delesse's work is to be found in the elaborate charts which accompany it. The character of these charts as specimens of map printing is very high, although it is questionable if the condensation of a great number of unallied statistical facts upon one sheet is favorable to the easy comprehension of such charts. A better plan would be to reproduce the same outline several times with different and strongly marked coloration or shading than to construct all curves of every kind upon one frame work, thus causing them to cross and recross one another to the bewilderment of the eye. Another difficulty for the reader arises out of the method adopted by M. Delesse for conscientiously representing all his facts upon a single sheet. Had the several kinds of curves been strongly portrayed they would so attract and confuse the eye as to entirely destroy the effect of the map as a whole. To avoid this the lines have been made so exceedingly fine, that if any one try to follow one of these curves he will need either an exceptionally good eye or a magnifying glass; in either case the character of a *boundary* between a territory on one side and a territory on another fails; for the moment the observer seeks to take in the entire curve at a glance it becomes invisible.

The datum plane is sea level. Heights are registered in the metre curves and depths by similar means. But in approaching the mountainous regions of France, one half the contour lines are omitted, lest they should shade

these portions of the map too deeply to allow of the delineation of the other portions. The unnatural effect is produced, of a map constructed on two different hypsometrical scales.

The distribution of rock, sand, slime, etc. along those sea bottoms which have been best observed (as for instance in the British Channel and along the routes of various deep sea sounding lines) is very interesting.

The great distance to which fluviatile sediments are carried and the separate although adjoining areas which the suspended matters of two widely separated river systems will occupy is strikingly shown in the distinct belts of St. Lawrence and Mississippi sand which overlap for 500 miles along our coast without commingling.

For his contribution to our knowledge of our own coasts M. Delesse deserves the hearty thanks of every student of American physical geography and geology.

Mr. Lesley added his testimony to the great value of the work of M. Delesse, of which Prof. Frazer had spoken:

He hoped that the Lithologie du Fond des Mers would be translated into English, and the magnificent maps accompanying it republished for the use of American geologists. If only the one map of the American continent and its enclosing water-beds were published, showing by colors the different sediments which issue from our rivers, and are distributed by tidal currents along our coasts, it would be a most valuable addition to our handbooks of geology. Many of the problems of erosion and sedimentation in Mesozoic and Kainozoic times, are plainly helped to solution by this map.

One of the most striking features is the contrast between the sediment in front of the coast from Maine to Alabama, and that of the sediment filling the St. Lawrence Gulf, and tapering southwards to a point opposite Norfolk. The former sediment fills the in-shore angle of the Gulf of Mexico, in front of Pensacola; the latter is repeated as an outside belt, stretching from the mouth of the Mississippi to a point in front of Havana.

It is easy to see the cause of the difference. The inside sediment descends the rivers which drain the siliceous and feldspathic mountains of New England, New York and Pennsylvania, Virginia, the Carolinas and Georgia, composed of Azoic and Palæozoic formations. The outside sediment descends the St. Lawrence and the Mississippi, and represents the drainage of the argillaceous and calcareous interior of the continent, composed of the Sub-carboniferous limestone formations east of the Mississippi, and of the broad stretches of Cretaceous and Tertiary rocks between the Mississippi and the Rocky Mountains.

The map suggests plainly the cause of the difference between the constitutional features of the eastern and western Cretaceous and the eastern and western Tertiaries.

A thousand details of this nature will repay the student of the map, to construct which must have tasked the zeal, as well as the knowledge, of the distinguished French geologist, its author, to the utmost.

M. Delesse is naturally desirous that this map should be known to American geologists, and to receive from them, directly or indirectly, such criticisms of it as will enable him to improve it in future editions.